

# Evaluation of University of Iowa-Owned Land for Wind Turbine Placement



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## Background

- The University of Iowa owns land approximately 11 miles south of the main campus in Iowa City
- Anemometer data were collected between 2007 and 2009 in ten minute intervals
- To determine the potential for this site, the data were analyzed and an economic assessment was performed

## Site Investigation

- The proposed site is on a 60 meter wide strip of land located 3 miles south-southwest of Hills, Iowa
- An anemometer tower is located 600 meters away from and 7 meters below the proposed site
- The land was previously used for an astronomical observatory, so it is located on top of a hill that is significantly higher than the surrounding land. This provides very favorable conditions for a wind turbine.
- The University property has a washout valley in the middle, so a turbine would need to be located on the East end of the property in order to keep the rotating blades from passing over the road.

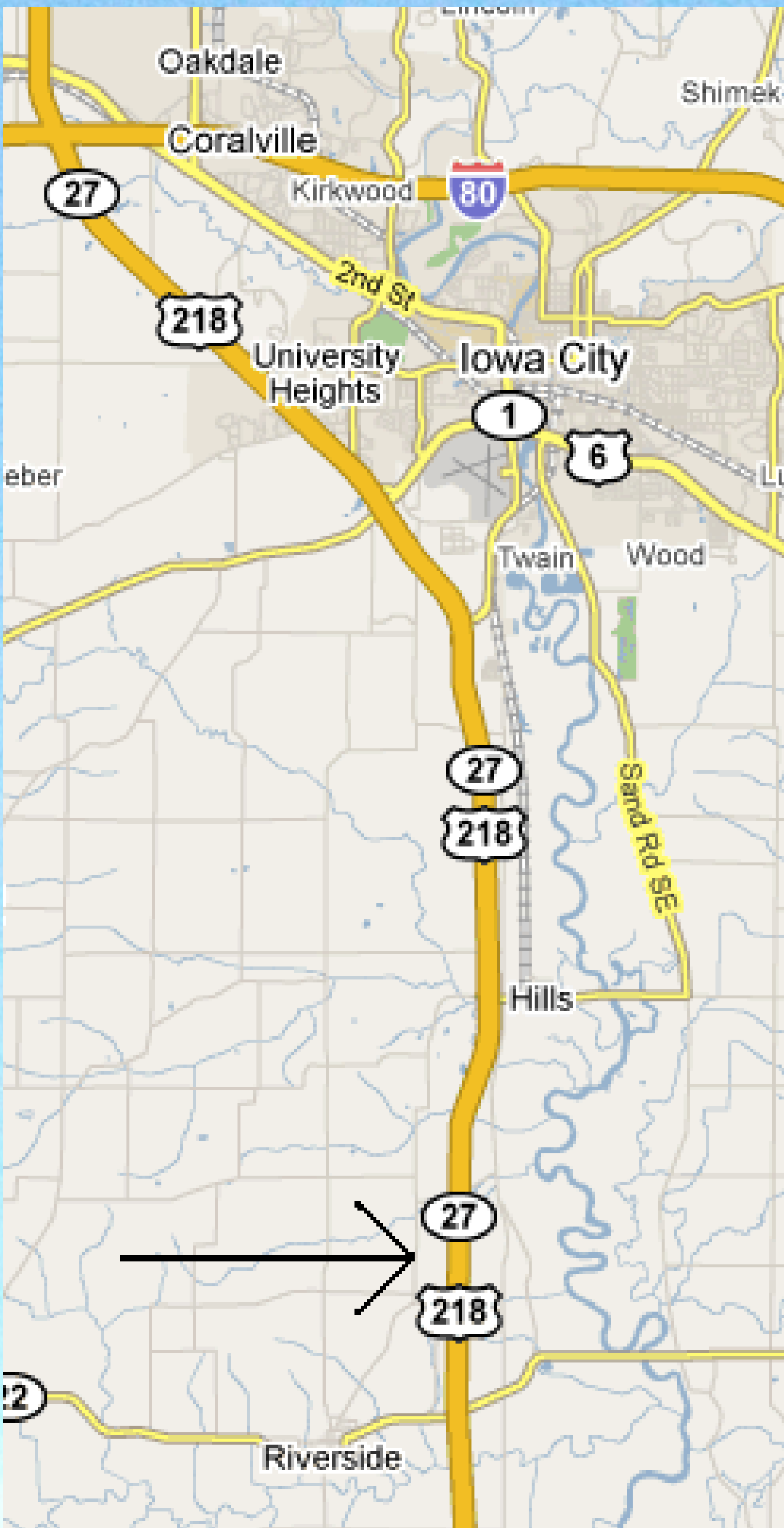


Figure 1: Location of proposed site

## Wind Data Analysis

- The wind data were collected over a period of 21 months from May 2007 to February 2009
- The average wind speed of each ten minute interval was sorted in order to calculate the total time that the wind spent at each given speed
- Wind speeds were adjusted for the height difference between the anemometer tower and the hub height for the turbine
- Using the power curve for the Clipper Liberty turbines (see Figure 3) and the sorted wind data, the monthly energy output was calculated for the C89 and C100 wind turbines (see Figure 4)

time (hours) x power (kW) = energy (kW-h)

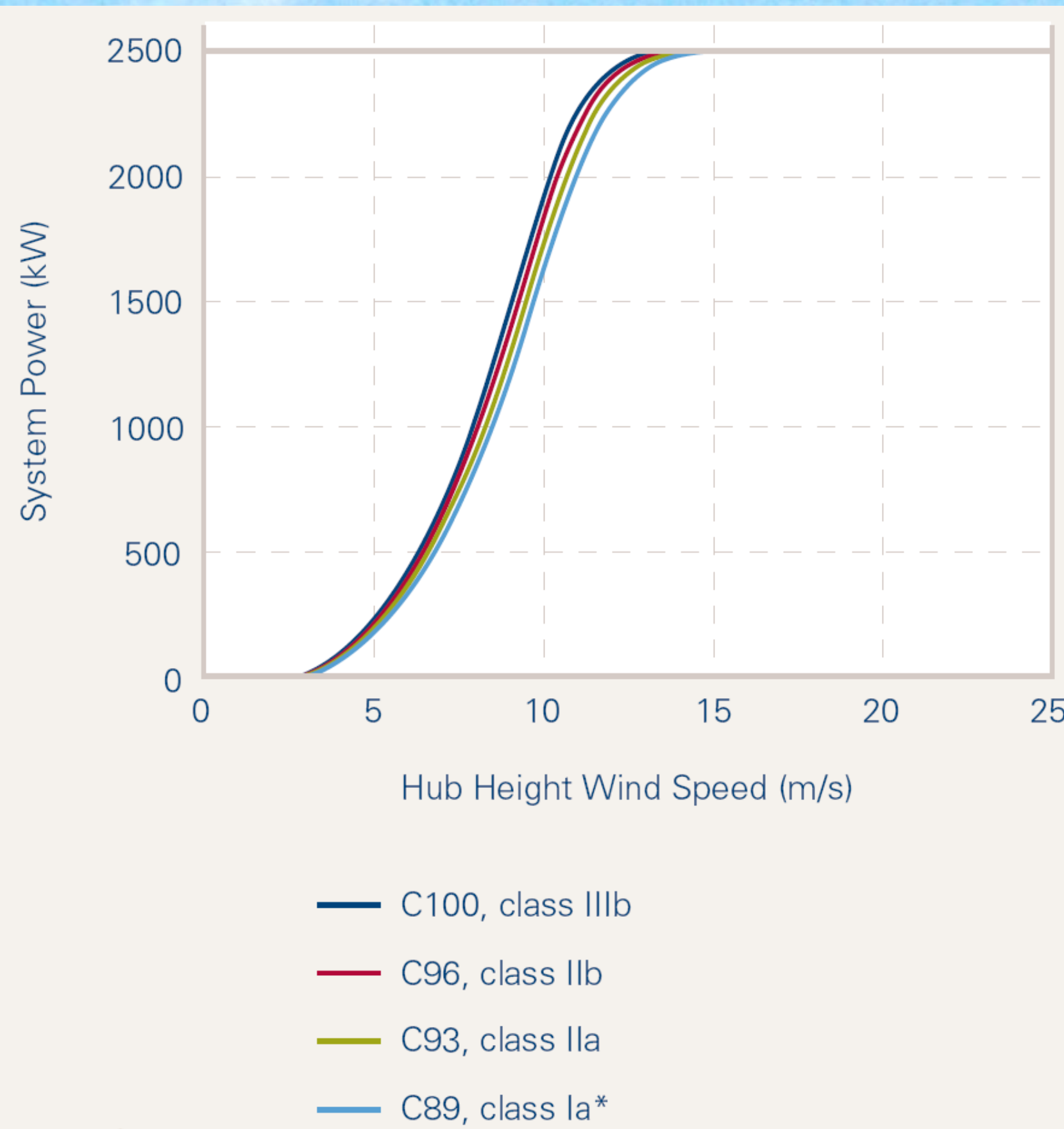


Figure 3: Power curves for Clipper Liberty wind turbines

	Clipper Liberty C89 (MW-h)	Clipper Liberty C100 (MW-h)
January	638.5	754.9
February	424.6	501.8
March	421.0	506.1
April	613.1	717.3
May	535.0	637.0
June	477.0	562.2
July	277.1	346.7
August	190.3	244.0
September	253.6	321.2
October	493.5	596.7
November	593.1	704.5
December	579.4	670.3
Annual	5496.2	6562.7

Figure 4: Monthly energy output for Clipper Liberty C89 and C100 wind turbines



Figure 2: Proposed site in relation to anemometer tower

## Payback Time for Clipper Liberty C100

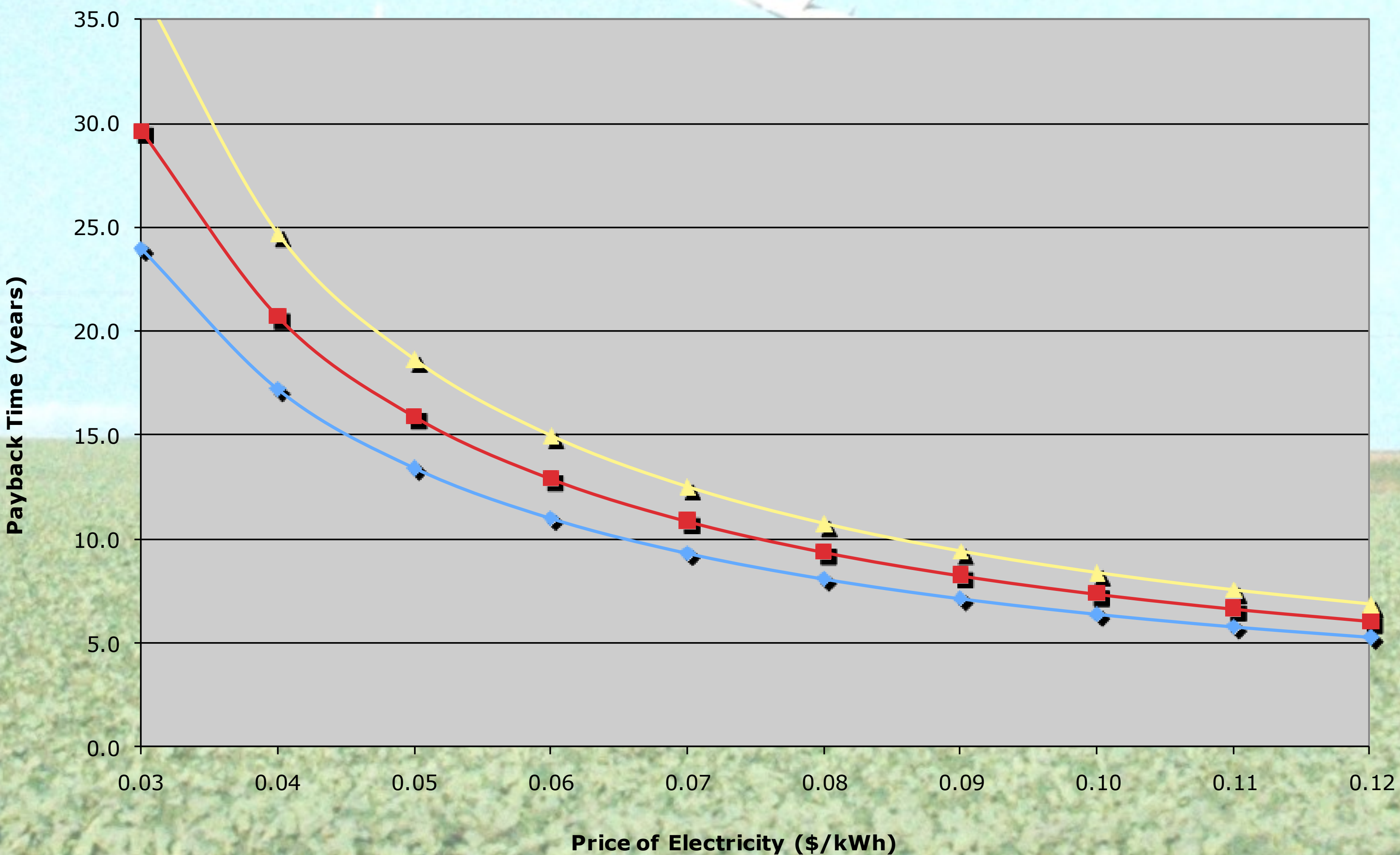


Figure 5: Payback time for Clipper Liberty C100

## Economic Analysis

- Using a combination of several estimates for initial cost, annual operation and maintenance costs, and price of energy, three estimates were generated for the payback time for the Clipper Liberty C100 and C89
- In Figure 5, payback time in years are given as a function of the price of electricity. The low payback time (assuming low initial costs, O&M, etc.) is given in blue, the medium payback time is in red, and the high payback time is given in yellow.

## Conclusions

- Each year, Liberty C89 and C100 would generate an estimated 5500 MW-h and 6500 MW-h of electricity, respectively. Though it is difficult to predict energy costs into the future, the economic analysis strongly suggests that the turbine would be paid off before the end of its lifetime.